

Test questions: **Antiderivatives**

This test covers antiderivatives and the evaluation form of the FTC (definite integrals).

No Calculator allowed.

Directions: Evaluate the following antiderivative. It is *not* necessary to simplify.

1. $\int x^3 + \sqrt{x} \, dx =$

2. $\int x^2 \sin(x^3) \, dx =$

3. $\int (4x-7)^8 \, dx =$

4. $\int \frac{(\ln x)^4}{x} \, dx =$

Directions: Find the value of the following definite integrals.

5. $\int_1^2 \frac{1}{x^3} \, dx =$

6. $\int_1^e \frac{x^3 - x}{x} \, dx =$

7. $\int_0^1 e^{-6x} \, dx =$

Directions: Circle the correct answer. Show any work that you do.

8. $\int_0^{\pi/3} \cos x \, dx =$

- a. $\frac{1}{2}$ b. $\frac{\sqrt{2}}{2}$ c. $\frac{\sqrt{3}}{2}$ d. $\frac{\sqrt{3}}{3}$ e. $\frac{\sqrt{3}}{2} - 1$

9. Using the substitution $u = 1 + 4x$, $\int_0^3 \sqrt{1 + 4x} \, dx$ is equivalent to

- a. $\frac{1}{4} \int_{-\frac{1}{4}}^{\frac{1}{4}} \sqrt{u} \, du$ b. $\frac{1}{4} \int_0^4 \sqrt{u} \, du$ c. $\frac{1}{4} \int_1^{13} \sqrt{u} \, du$
d. $\int_0^3 \sqrt{u} \, du$ e. $\int_1^{13} \sqrt{u} \, du$

10. What are all values of k for which $\int_{-3}^k x^2 \, dx = 0$?

- a. -3 b. 0 c. 3 d. -3 and 3 e. $-3, 0$ and 3

11. If $f(x) = g(x) - 5$ for $3 \leq x \leq 7$, then $\int_3^7 [f(x) + g(x)] dx =$

- a. $2 \int_3^7 g(x) dx - 5$ b. $2 \int_3^7 g(x) dx - 20$ c. $\int_3^7 g(x) dx - 5$
d. $\int_3^7 g(x) dx - 10$ e. $\int_3^7 g(x) dx - 20$

For BC only. Find the following antiderivatives.

12. $\int \frac{1}{(x-5)(x-3)} dx =$

13. $\int x \sin(x) dx =$

Answers and points:

Deduct 1 point for any correct answer simplified incorrectly. Simplification is NOT required, but if attempted must be correct.

Deduct 1 point for each missing “+C” up to a maximum of –3.

1. [3] $\frac{x^4}{4} + \frac{2}{3}x^{\frac{3}{2}} + C$

2. [3] $-\frac{1}{3}\cos(x^3) + C$

3. [3] $\frac{1}{9} \cdot \frac{1}{4}(4x-7)^9 + C = \frac{1}{36}(4x-7)^9 + C$

4. [3] $\frac{(\ln x)^5}{5} + C$

5. [3] $\frac{3}{8}$

6. [4] $\frac{e^3}{3} - e + \frac{2}{3}$

7. [3] $-\frac{1}{6}(e^{-6} - 1)$

8. [3] C $\frac{\sqrt{3}}{2}$

9. [3] C $\frac{1}{4} \int_1^{13} \sqrt{u} \, du$

10. [3] A –3 only

11. [3] B $2 \int_3^7 g(x) \, dx - 20$

12. BC ONLY: [5] $\frac{1}{2} \ln(|x-5|) - \frac{1}{2} \ln(|x-3|) + C = \frac{1}{2} \ln\left(\frac{x-5}{x-3}\right) + C$

13. BC ONLY: [4] $\sin(x) - x \cos(x) + C$